Closely-Spaced Parallel Approaches

RTCA SC-186 Working Group 1

Applications/CSPA Sub-Group Joint Meeting

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Closely-Spaced Parallel Approaches

Objective:

✈ *Maintain VFR airport arrival rates at airports with closely-spaced parallel runways regardless of visibility conditions*

Purpose:

✈ *Develop a distributed air and ground system to provide airborne separation assurance monitoring and alerting in order to conduct simultaneous independent operations to closely-spaced runways in IMC*

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Guiding Principles:

🛬 *Maintain or improve present safety level*

🛬 *Minimize changes to present pilot and ATC responsibilities and procedures*

🛬 *Minimize the probability of an aircraft deviating from its assigned approach trajectory (referred to as a "blunder")*

🛬 *TCAS and CSPA remain functionally independent. TCAS is active for all aircraft not conducting CSPA approaches*

🛬 *True blunders resulting in another aircraft breaking off the approach are extremely rare events, orders of magnitude less frequent than "normal" missed approaches. Concept must address both adequately*

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CSPA Outline:

Accurate and highly reliable navigational guidance on approach is provided by DGPS

Each aircraft communicates its DGPS position via ADS-B to all aircraft approaching the parallel runways

All CSPA traffic is displayed on the CDTI

ATC relinquishes surveillance, monitoring and alerting for lateral separation to the aircraft conducting CSPA approaches, and standard terminal separation requirements are waived

ATC manages in-trail separation between aircraft in each parallel approach stream and separation from other aircraft not on final approach to the parallel runways

Specialized alerting algorithms issue alerts when a loss of minimum separation is expected to occur within some defined time interval.

In the event of a missed approach or breakout maneuver, all surveillance and separation responsibility is returned to ATC when the aircraft contacts them

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Conceptual CDTI:

◄ **Primary flight display**

LOCALIZER

Caution

Lateral path information

◄ **Navigation display**

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Own airplane symbol

Traffic symbol
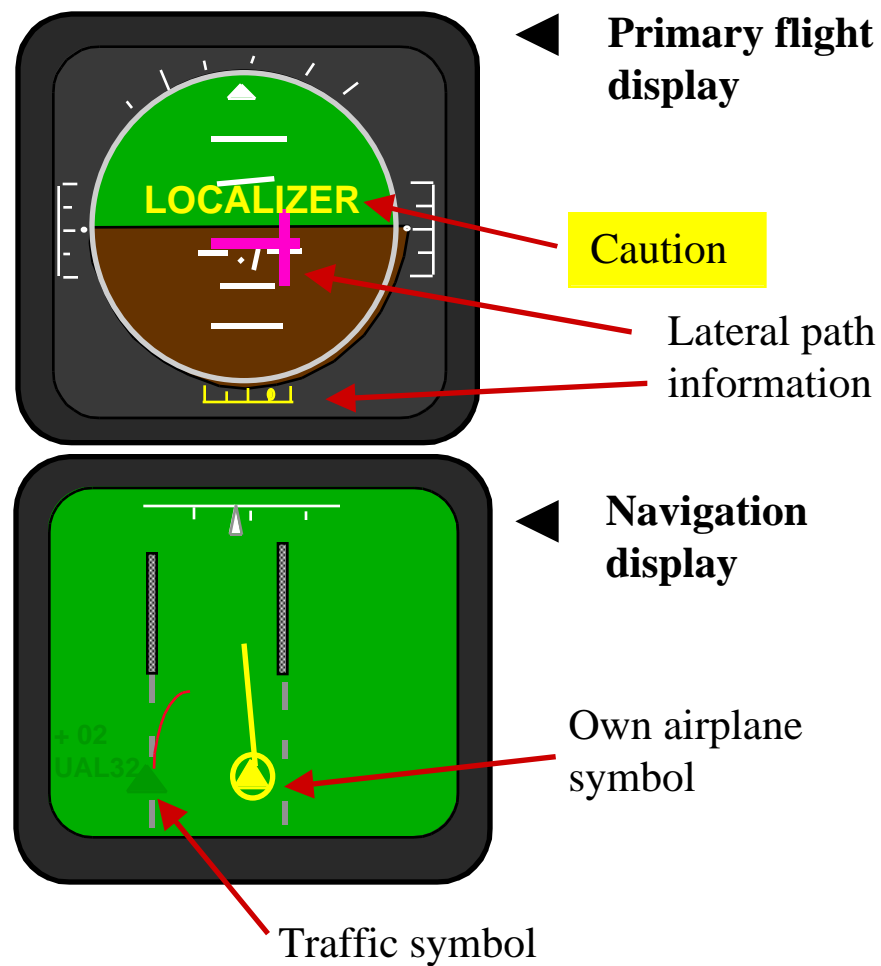
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Alert Sequence:

1. *When an aircraft conducting a CSPA approach wanders off course by an amount in excess of the required DGPS navigation accuracy (`~20 meters from centerline), it gets an instruction to return to course*

2. *If the aircraft does not respond, any aircraft on the parallel approach that is beginning to be threatened by the wandering aircraft gets a warning similar to a TCAS "TA"*

3. *If the blundering aircraft continues to deviate from its assigned approach path, it gets an instruction to execute a missed approach, turning away from the parallel traffic*

4. *If the blundering aircraft does not respond, and its trajectory indicates a threat to an aircraft on the parallel approach, the threatened aircraft gets an instruction to execute a breakout maneuver, a climbing turn away from the blundering aircraft*

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CSPA Philosophy:

- *Prevent the blunder*

  Accurate and reliable navigation provided by DGPS

  Early CDTI and aural caution to "wandering" aircraft

  Instruction to execute missed approach if aircraft continues to wander

  Probable contact from ATC to wandering aircraft

- *Only in the extremely rare event when the separation assurance function has failed does the threatened aircraft get the instruction to execute the breakout maneuver*

- *If CSPA is implemented at all suitable airports, most pilots will fly their entire careers without ever having to execute a breakout maneuver, except in simulator training*

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Work Accomplished and in Progress:

- *Preliminary Operations Concept prepared,based on Langley Airborne Information for Lateral Spacing (AILS) concept*

- *Companion draft Issues Document prepared*

- *Monte Carlo simulation using FAA's Airspace System Analysis for TERPS (ASAT) underway, with preliminary results expected in March '99. This will provide*
    - *evaluation of success rate of alerting system in preventing NMAC*
    - *comparison to PRM*
    - *sensitivity to pilot response times, ADS-B message update rate, accuracy etc, navigation accuracy*

- *Part-task and full mission procedures simulations underway, to be completed in 2000*

- *Operational simulation and flight test using Langley Boeing-757 and Honeywell Gulfstream IV in September '99 (to be described by Terry Abbott)*

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Issues to be resolved by further research:

- Role of ATC
    - Down link of alerts to ATC
    - ATC attempts to prevent blunder by contacting blundering aircraft
    - Return of all surveillance and separation responsibility to ATC if missed approach or breakout maneuver is initiated

- Effectiveness of single 45^0 climbing turn breakout maneuver

- Missed approach, including simultaneous missed approaches and blunder during missed approach

- Pilot compliance with alerts, especially close to DH or during a missed approach

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For more information on CSPA, try

http://www.asc.nasa.gov/tap/cspa/cspa.html

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